Stress Responses to Visual Threat

An Honors Thesis (HONR 499)

by

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Abstract

There is a need for in-depth research into the individual symptoms of schizotypy to not only further understanding of how these symptoms interact in the condition itself, but also in the larger schizophrenia spectrum. Because many symptoms, such as paranoia and constricted affect, are commonly present in a wide variety of disorders, research into their psychological and neurological origins will contribute to research in multiple disorders, not just schizotypy and schizophrenia. There are many biological and environmental factors that influence the intensity of symptoms in disorders. In schizotypy, stress is a measurable factor that influences and is influenced by paranoia. This study aimed to assess the relationships between paranoia, constricted affect and stress responses to threat. Constricted Affect was used as a measure of one negative schizotypal symptom. In this study, participants were presented threatening images while heart rate and skin conductance levels were recorded to investigate differences in physiological responses among the range of schizotypy scores on the Schizotypal Personality Questionnaire (SPQ). Results show that participants did rate threatening images as more threatening than neutral images, but that the physiological responses were not significantly different between the two image types. While none of the hypotheses were supported by the data, exploratory analyses show that baseline heart rate and heart rate responses to neutral images can significantly predict paranoia scores.

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Process Analysis Statement

From early in my college career I knew I wanted to go into the research and academic world of psychology and neuroscience. Deciding what to do for my thesis was simple since I knew I wanted to start my research career with a thesis focused on something I wanted to continue researching in my future. I have had a strong interest in stress and fear processes since high school and a separate interest in psychopathology, specifically schizophrenia spectrum disorders. My advisor, Dr. Simon-Dack, guided me to the field of schizotypy research. Here I found a connection between schizotypy, paranoia, and sensitivity to threat and stress. The process to deciding on my topic and research questions was a natural flow in the beginning. I learned the most valuable skills and overcame some challenges during the process of constructing the study design, and then interpreting the bigger implications of my results.

When constructing my experiment design, I had to not only learn how to work with different experiment software, but also research and choose statistically sound independent variable measures and manipulations. The International Affective Pictures System is the database of emotional images that I decided to choose my threatening and neutral stimuli from. After deciding that, I had to learn how to use the database, analyze the various qualities of the images, and then find the images that would work best for my study and its goals. I had a similar process in working with the Schizotypal Personality Questionnaire and its subscales. Once I chose the materials I wanted to use for my manipulator variables, I then went through a difficult process of creating an experiment with software called Eprime and putting together a large questionnaire in an online program called Qualtrics. The practical stage of creating my study design was the most difficult part of my thesis process. The second most challenging part of the thesis process was analyzing my results.

While the data collected from my study is interesting and has some great potential in the field, it was a little disheartening to see that none of my hypotheses were supported. This was a great lesson in the basic nature of science and research. Studies are conducted in order to test hypotheses and find the truth behind various theories and scientific questions, not to prove hypotheses. I feel as though I did not forget this fact, but rather I felt so confident in my background research that I did not expect the data to disprove my hypotheses. The various correlations and regressions that came from my data though were enlightening and valuable, regardless of what my previous ideas were on the expected outcomes. These various challenges from analyzing the relevant body of research to interpreting the results made me an overall better researcher and better academic. I feel much more prepared for my future in research and I am excited to explore more research and hypotheses in my chosen field.

Schizotypy, Paranoia, and Threat: Stress Responses

One theoretical model regarding the onset of mental illness is the stress-diathesis model. This model states that psychiatric illness has a genetic basis, but this alone does cause a disorder. When environmental stress acts upon those genes, symptoms of various psychiatric illnesses increase in intensity and frequency (Breier, 1995). While no singular gene, or gene abnormality, has been found to directly cause a psychiatric illness, there have been large clusters of genes that are shown to be correlated with symptoms of schizophrenia, autism spectrum disorder, attention-deficit disorder, Alzheimer's, and many others (Sundararajan, Manzardo, & Butler, 2018; Schizophrenia Working Group of the Psychiatric Genomics Consortium, 2014). Furthermore, in patients with schizophrenia, onset and relapse of the disease is often preceded by a major stressful event, or a consistent increase in minor stressors (Breier, 1995). Research today also suggests a cyclical relationship between stress and mental illness (Haralanova, Haralanov, Beraldi, Moller, and Hennig-Fast, 2011; Felmingham, Rennie, Manor, and Bryant, 2011).

Haralanova, Haralanov, Beraldi, Moller, and Hennig-Fast investigated the relationship between subjective emotional arousal to neutral and threatening images in participants diagnosed with paranoid schizophrenia and healthy control participants (2011). It was found that participants with schizophrenia had a much greater emotional response to neutral images than the control group (Haralanova et al., 2011). Research on the effects of a diagnosis on stress responses has also been done with participants with post-traumatic stress disorder (PTSD). Felmingham, Rennie, Manor, and Bryant investigated the relationship between a diagnosis of PTSD and physiological stress responses to traumatic word cues (2011). Results showed that participants with PTSD had significantly more initial fixations and significantly higher skin

conductance responses to trauma cues than participants who experienced trauma, but did not develop PTSD (Felmingham et al., 2011).

Skin conductance is a common measure for stress responses, as it is an indicator of sympathetic nervous system activation. In the previous study, the researchers were not able to conclude if the stress responses were higher due to increased fixations on trauma cues, or if the disorder itself caused an increase in sensitivity of stress responses. However, both the Haralanova et al. and Felmingham et al. studies reported that the individuals with diagnosed disorders had increased emotional and physiological arousal compared with the control groups. While stress may initiate and exacerbate disorders, such as schizophrenia and PTSD, the symptoms of the disorder may further contribute to the levels of stress that affect an individual's experience. Because thought patterns can directly affect behaviors and stress levels, disorders in thought processes potentially increase stress levels, which can in turn intensify the symptoms of a disorder (Vernikos-Danellia & Heybach, 1980). Paranoia is a common symptom in schizotypy and schizophrenia that refers to a person's level of certainty or apprehension that others' intentions are negative or threatening (Horton, Barrantes-Vidal, Silvia, & Kwapil, 2014). This symptom is sensitive to stress levels, and individuals high in paranoia often have more dramatic stress increases and higher resting stress levels (Ragsdale et al., 2013; Haralanova et al., 2011; Westermann, Kesting, & Lincoln, 2012). This study aims to explore and evaluate the role of paranoia on stress.

Stress Responses

A common working definition of stress used in psychology research was formally laid out by Dr. Hans Selye in 1956, "… it is caused by function or damage and stimulates repair" (p. 530). In this definition, stress can be caused by something positive or negative. The term

"repair" refers to the body or mind's attempt to relieve or compensate for the stress. This attempt at repair often comes in the form of mental illness as the mind sometimes creates dysfunctional thought processes or has dysfunctional neuron activity (Selye, 1956). If stress becomes intense and persistent in an individual, the mental and physical health of the individual can deteriorate into disorders such as depression, anxiety, post-traumatic stress disorder, and a variety of psychotic symptoms, as suggested by the stress-diathesis model (Guest et al., 2011; Muenzenmaier et al., 2015). Stress can be caused by many internal and external factors including a traumatic event, real or imagined threat, and social neglect or isolation. Individuals who score high in paranoia or who are diagnosed with Paranoid Schizophrenia are uniquely susceptible to stress due to higher rates of anxiety, self-consciousness, and sympathetic nervous system activity (Freeman et al., 2013; Westermann, Kesting, & Lincoln, 2012; Pinkham et al., 2015). Many studies show that an increase in the level of perceived control over a stressor, which is often lacking in intense symptoms of paranoia, can mitigate the experience of stress (Averill 1973; Ring, 2015).

Schizotypy

The term schizotypy refers to the collection of psychological and personality characteristics common in schizophrenia spectrum disorders (Meehl, 1990). These characteristics are often milder than in those with a diagnosis of schizophrenia and do not necessarily have a genetic basis. Schizotypy characteristics are common even in neurotypical populations and are often learned or socialized (Meehl, 1990). The prevalence of schizotypal symptoms at a sub-clinical level has been a great asset to personality and stress research, due to the wide range of symptom severity and the presence of these symptoms in other disorders (Boyle, Matthews, & Saklofske, 2008). Schizotypy research also contributes directly to the body of schizophrenia

research as individual symptoms in schizotypy can be used as models for more severe symptoms common in clinical schizophrenia. Furthermore, individuals high in schizotypy are at a higher risk for developing schizophrenia over the course of a lifetime and, typically have higher levels of anxiety, resting sympathetic nervous system activity, and self-reported aggression (Meehl, 1990; Cosoff & Hafner, 1998; Pinkham et al., 2015; Horan, Blanchard, Clark, & Green, 2008). Those who score high on schizotypy scales and those diagnosed with paranoid schizophrenia typically have less salient emotional reactions, yet have higher sympathetic nervous system arousal baselines and reactions to emotional images (Mitchell et al., 2015; Harlanova et al. 2012; Premkumar et al., 2015; Pinkham et al., 2015). Even amygdalar and general limbic system blood flow have higher resting rates in those who are diagnosed with paranoid schizophrenia than neurotypical and non-paranoid schizophrenic populations (Pinkham et al., 2015). Paranoia may be the specific symptom contributing to more sensitive stress response systems in both sub-clinical and clinical schizotypy and schizophrenia populations.

Stress and Paranoia

Paranoia shares similarities with social anxiety. Both are characterized by avoidance of social situations and hyper-self-awareness, yet are typically only moderately to weakly correlated with each other (Horton et al., 2014). The classification of anxiety and paranoia as distinct symptoms within schizophrenia spectrum disorders is further supported by the findings of Cosoff and Hafner (1998) which showed 43% of participants with schizophrenia and 45% of participants with schizoaffective disorder had one or more diagnoseable anxiety disorders separate from their primary diagnosis. Because of this distinction, researchers can study the relationship between paranoia and stress while controlling for levels of anxiety.

Individuals on the schizophrenia spectrum who have elevated levels of paranoia report significantly greater minimum interpersonal distances at which they begin to feel uncomfortable (Schoretsanitis, 2016). Because paranoid individuals report needing more interpersonal space to feel comfortable, they may have higher sympathetic nervous system responses, or stress responses, when compared to non-paranoid individuals.

Eliciting and Measuring Stress. Despite stress being a subjective concept and feeling, there are numerous methods of objectively measuring stress. Stress today is most commonly measured by increases in an individual's sympathetic nervous system response. This is the bodily system in control of adrenal gland activation, constriction of blood vessels, heart rate acceleration, skin conductance increase, and several other physiological responses to stressors (Bear, Connors, & Paradiso, 2007). Modern technology allows researchers to measure stress responses with heart rate monitors, skin conductance monitors, cortical blood flow, cortisol spit tests, and other methods (Pinkham et al., 2015; Ring, 2015; Bach & Friston, 2013; Kirschbaum & Hellhammer, 1994).

To measure stress responses in an experimental setting, researchers must elicit stress by standardized and ethical means. This is measured in a variety of ways, such as framing effects (Averill, 1973; Ring, 2015), or emotionally arousing images (Bach et al. 2009; 2013; Cosoff & Hafner, 1998). Framing in stress research typically involves using positive or negative words to alert the participant of an impending aversive stimuli (Averill, 1973; Ring, 2015; Sittenthaler, Steindl, & Jonas, 2015). This forces participants to use more cognitive power and decision-making to determine the level of stress they should feel about the threat. Participants not only have to read the words, but then make inferences regarding the consequences of the words. This style of stressor tests a participant's judgment more than a preconscious reaction. Research that

uses images to elicit stress responses in participants allows for more immediate and primitive stress responses (Bach et al., 2009; Bach & Friston, 2013; Pinkham et al., 2015; Cosoff & Hafner, 1998). One commonly used image database, the International Affective Picture System (IAPS), is a collection of images organized into varying categories including highly positively arousing, neutral, and highly negatively arousing (Coan & Allen, 2007). This system allows researchers to test the effects of different stimuli on the stress response systems, for example images depicting threats towards humans versus towards animals (Coan & Allen, 2007). While higher-level cognitive processing takes place when viewing images for an extended period, researchers can study the more basic and immediate stress responses by showing highly arousing images for a short amount of time (Bach et al., 2009; Huang & Luo, 2006). This system of eliciting stress responses is especially helpful when studying the underlying cognitive and neural processes in clinical or borderline clinical populations.

Measuring Schizotypy. Like many other measurement scales, reliable and valid schizotypy scales have taken decades to produce and publish. Rosenhan was one of the first researchers to point out the inaccuracy of diagnostic measures and standards in his 1973 study titled "Being Sane in Insane Places". Common issues regarding this area of research include changing definitions of schizotypal personality disorder and schizophrenia throughout the volumes of the Diagnostic Statistical Manual (DSM). The DSM I describes schizotypal symptoms as "schizophrenic reactions", subdivided into nine different types (American Psychiatric Association, 1952). The various types were only vaguely described and would be considered individual symptoms by modern diagnostic tools. For example, the "schizophrenic reaction: simple type" may be more comparable to a schizotypal personality in later research. This subtype of the schizophrenic reaction was characterized by decrease in sociability, relationships, and

interests, and a lack of any delusions or hallucinations (American Psychiatric Association, 1952). There was also the issue of symptoms qualifying for multiple, but conflicting, diagnoses under this manual. For example, paranoid reactions, schizoid personality, and schizophrenic reaction: paranoid type each had nearly identical descriptions, yet also had disclaimers that one could not be diagnosed with the other (American Psychiatric Association, 1952). This edition of the DSM was only a starting point and the manual quickly became more specific. In the DSM III-R, the criteria for schizotypal personality disorder included the presence of at least five of nine symptoms (American Psychiatric Association, 1987). These are the same nine symptoms that modern diagnostic manuals, interviews, and questionnaires reference. The latest update in language surrounding schizotypal personality disorder in the DSM 5 is the specification of the individual's discomfort with and reduced cognitive capacity in the nine factors mentioned previously (American Psychiatric Association, 2013). This edition also mentions the necessity for a pattern of symptoms in a variety of settings, excluding a manic or depressive episode with psychotic features. Many scales exist now to more accurately measure the presence and intensity of schizotypal symptoms.

Historically, there was not one schizotypy scale, but many scales measuring different aspects of schizotypy and paranoia symptoms. In Meehl's 1973 *Psychodiagnosis: Selected Papers*, he called for objective and psychometrically defined measures for symptoms of schizotypy that deviate from the traditionally subjective interviews performed by mental health clinicians. In the decade following, more than a dozen self-report scales for schizotypal symptoms were published and subsequently combined into comprehensive surveys by many contributing researchers such as, Eysenck, Eckblad, Claridge, and many others (Boyle, Matthews, & Saklofske, 2008). Many

of these questionnaires measured individual symptoms, such as paranoia, magical ideation, and social anhedonia.

The Paranoia Scale was designed to objectively measure this symptom in non-clinical populations and has been used in comparisons to beliefs about paranoia, clinical paranoia symptoms, and the subjective experience of paranoia (Gumley, Gillan, Morrison, & Schwannauer, 2011; Freeman et al., 2005; Ellett, Lopes, & Chadwick, 2003). This scale measures the presence of paranoia in isolation from the other nine symptoms of schizotypy, such as constricted affect, or odd speech and behaviors.

The Schizotypal Personality Questionnaire (SPQ) was created as a comprehensive self-report measure that included all nine symptoms of schizotypy in the sub-clinical population. This now allows researchers to study individual symptoms as well as general schizotypy with a single questionnaire (Raine, 1991). The SPQ was created using a mix of sources, such as the DSM-III-R, clinical interview questions, previously published schizotypy questionnaires, and new items generated by the author (Raine, 1991). Because of this variety, this questionnaire can be administered to non-clinical and clinical populations to study various aspects of the schizotypy spectrum. The SPQ continues to be reliable and valid after the publication of the latest DSM revisions (Fonseca-Pedrero et al., 2014; Zhang & Brenner, 2017).

The Current Study

Because of the previous research indicating a positive relationship between paranoia and stress levels, the current study will investigate effects of threat stimuli on stress levels in paranoid individuals. Paranoia is a prevalent symptom in those on the schizotypy and schizophrenia spectrums, and is often exacerbated by other distressing symptoms, such as social anxiety, delusions, and disorganized thoughts (Meehl, 1990; Cosoff, & Hafner, 1998; Ellett,

Lopes, & Chadwick, 2003). Investigating the triggers for stress in individuals high in paranoia will provide a better insight into the nature of this characteristic symptom, and inform how to better cater treatment for symptoms of intense paranoia across many disorders.

While paranoia has typically been considered a positive symptom in schizotypy and schizophrenia research, it shares characteristics with negative symptoms, such as the presence of social anxiety or avoidance (Bedwell et al., 2014; Peralta & Cuesta, 1994; Raine et al., 1994). Negative symptoms in schizotypy refer to a lack of expected characteristics, like finding enjoyment from social activities or expressing emotions (Peralta & Cuesta, 1994). Psychometric tools like the Positive and Negative Syndrome Scale (PANSS) are designed to measure specific symptoms categorized as either positive or negative (Kay, Fiszbein, & Opfer, 1987). While there are many instances in which positive and negative symptoms are clearly distinct and contribute to disorders in separate ways, research isolating the two clusters of symptoms can undermine the similarities that symptoms share between these categories. While the expression of stress, and expressed emotion in general, is one major difference between positive and negative symptoms (Ragsdale et al., 2013; Bedwell et al., 2016; Mitchell et al., 2015) the experience of stress is still clearly present in both clusters of symptoms (Kadison et al., 2015). Further exploring the relationship between paranoia and more traditionally negative symptoms, such as constricted affect, may further clarify the similarities or differences in positive and negative symptoms.

Hypotheses. To this end, the present research will be using physiological assessment to determine the interplay between levels of paranoia, constricted affect and stress responses to threat. The proposed hypotheses are that (1) there will be greater skin conductance and heart rate responses to threat images over neutral images across all participants, (2) skin conductance and heart rate responses to threat images will increase as paranoia scores increase, and that (3) skin

conductance and heart rate responses will differ in those who have higher constricted affect scores than paranoia scores, in response to both threatening and neutral images.

Method

Overview

This study examined the differences in stress responses among those who score high or low in paranoia measured by the SPQ. This study further explored how schizotypy symptoms influence stress responses by comparing one positive and one negative symptom; paranoia and constricted affect. In post-hoc exploratory analyses, physiological and behavioral data was used to predict paranoia and schizotypy scores.

Participants

Participants were 39 undergraduate students (28 female, 11 male, 87.2% White, 10.3% Black, 2.3% Latino/a, M_{age} = 19.74, SD_{age} = 3.27) from Ball State University. Participants were recruited through email and the psychology and marketing departmental subject pools, used to distribute course credit. Participants were compensated with either course credit, if recruited from departmental pools, or with a gift card, if recruited by email. One participant was excluded from analyses due to a mental illness diagnosis that would conflict with symptoms measured by the SPQ.

Materials

Schizotypal Personality Questionnaire. This study used the Schizotypal Personality Questionnaire (SPQ) to measure paranoia (See Appendix A) (Raine, 1991). The SPQ is made of nine subscales; ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behavior, lack of close friends, odd speech, constricted affect, and suspiciousness (Raine, 1991). The SPQ is a questionnaire made of 74

Yes/No response items analyzed by counting the items marked as "Yes" (Raine, 1991). Because of the previously demonstrated connection between self-awareness and paranoia (Horton et al., 2014), both the ideas of reference and paranoid ideation subscales will be used to assess overall paranoia. All subscale data, including item number, reliability and validity scores, were obtained from the original article outlining the SPQ development in Raine's 1991 article.

The ideas of reference subscale measures to what degree the participant is preoccupied with how often the environment or other people focus on the participant, for example, "Do some people drop hints about you or say things with a double meaning?" These include questions 1, 10, 19, 28, 37, 45, 53, 60, and 63. This subscale had a coefficient alpha of 0.71 in both the first and second samples. The correlation between this subscale and the Structured Clinical Interview for DSM-III-R showed strong criterion validity with a Spearman's *r* score of 0.80.

The paranoid ideation subscale measures how much the participant is preoccupied with the threat other people pose to his/herself and defending against that threat, for example, "Do you often have to keep an eye out to stop people from taking advantage of you?" This subscale includes questions 9, 18, 27, 36, 44, 52, 59, 65. The coefficient alphas were 0.78 and 0.73 in the first two samples respectively. The correlation between this subscale and the Structured Clinical Interview for DSM-III-R was moderate with a Spearman's *r* of 0.58.

This questionnaire also measures negative symptoms, such as constricted affect, lack of close friends, and odd speech. Constricted affect is the reduction, or lack of, appropriate emotional expression (Kadison et al., 2015). An example of an item measuring constricted affect in the SPQ is, "I do not have an expressive and lively way of speaking." This subscale includes items 8, 17, 26, 35, 43, 51, 68, and 73. The coefficient alphas were 0.66 and 0.65 for the first and

second samples respectively. The correlation between this subscale and the Structured Clinical Interview for DSM-III-R had a Spearman's *r* of 0.72.

International Affective Picture System. This study used the IAPS to retrieve images to be shown to participants. In the IAPS, images are rated on three affective categories using the Self-Assessment Manikin (SAM) rating system with scores ranging from 1 to 9. (Lang, Bradley, & Cuthbert, 2008). In this rating scale, a higher numerical arousal score means that the participants felt higher subjective levels of excitement when viewing the image. A lower valence score means the image was rated as more unpleasant. A lower dominance score means the participants indicated that they felt less in control, or more submissive, when viewing the presented image. The image choice was based on the Ragsdale et al. (2013) neutral and threatening images. Ragsdale et al. used five neutral images that ranged between 1.72 and 2.61 mean arousal rating and 4.87 to 5.27 mean valence rating. The threatening images ranged from 5.18 to 6.93 mean arousal rating and 2.44 to 4.03 mean valence rating. Normative data on the SAM affective ratings for IAPS images used in this study have been published (Land, Bradley, & Cuthbert, 2008) and can be found in Table 1. Threatening images used in this study range from 2.09 to 3.79 in valence, 5.18 to 6.93 in arousal, and 2.40 to 4.52 in dominance. Neutral images used in this study range from 4.45 to 5.04 in valence, 1.72 to 2.66 in arousal, and 5.33 to 6.74 in dominance.

Mean ratings and t-values for threatening and neutral images can be found in Table 2. An independent samples t-test indicated that Threat Valence ($M = 3.07$, $SD = 0.54$) had significantly lower ratings than Neutral Valence ($M = 4.79$, $SD = 0.20$), $t(9) = -7.89$, $p < .01$, meaning that the threatening images were more unpleasant than the neutral images. An independent samples t-test indicated Threat Arousal ($M = 6.33$, $SD = 0.55$) had significantly higher ratings than Neutral

Arousal ($M = 2.25$, $SD = 0.35$), $t(12) = 16.58$, $p < .01$, meaning that threat images were more arousing than neutral images. A third independent samples t-test indicated that Threat Dominance ($M = 3.60$, $SD = 0.62$) had significantly lower ratings than Neutral Dominance ($M = 6.07$, $SD = 0.49$), $t(13) = -8.26$, $p < .01$, meaning the threat images were rated as more domineering than the neutral images.

Procedure

Upon entering the study room, participants were asked to sit and fill out the informed consent form and complete the SPQ on a laptop through Qualtrics. SCL and heart rate will be recorded using the iWorx 214 Psychophysiology Teaching Kit (iWorx System). Participants were asked to wash their hands before physiological data collection to remove natural oils or dirt that would interfere with electrode connectivity. Two reusable electrodes were placed on the middle and index fingers of the participant's left hand to measure skin resistance, a measure of skin conductance levels. A pulsar electrode was placed on the left middle finger to measure heart rate.

Participants were then asked to complete the behavioral task using the IAPS. Participants were shown 16 images, pre-selected and categorized as either "Threatening" or "Neutral". Images were shown in a randomized order for 8 seconds, followed by a screen prompting the participant to rate the picture on how threatened they feel (1 "not at all" to 5 "very much so"), and then a blank screen lasting 3 seconds. The image presentation procedure was loosely based on Ragsdale et al. (2015) image presentation procedure, with addition of the threat rating scale. The subjective threat rating scale was added to test the validity of the desired emotion elicitation.

Results

Scale Testing

For each participant, the average heart rate and skin conductance levels were used for analyses. Baseline levels were the average heart rate and skin conductance over a span of 2 minutes with no activity. The average heart rates and skin conductance levels for each of the threatening images were averaged into one heart rate and one skin conductance level reaction to threatening images. The same was done for neutral images. The SPQ was scored by calculating the sum of all positively endorsed questions. The total paranoia score was the sum of positively endorsed questions in the ideas of reference and suspiciousness subscales. The constricted affect score was the sum of positively endorsed questions in the constricted affect subscale. The total SPQ ($M = 20.95$, $SD = 10.967$) and paranoia scale ($M = 5.71$, $SD = 3.41$) demonstrated adequate to high reliability with a Cronbach alpha of at least .75. The constricted affect scale ($M = 1.71$, $SD = 1.66$) had a less than adequate reliability score with a Cronbach's alpha of just .66. These statistics can be found in greater detail in Table 3.

A paired-samples t-test was used to test whether participants rated threatening and neutral images differently in the subjective image rating task, which was added as a measure of validity on the threat levels for each image, showed that participants rated threatening images ($M = 2.822$, $SD = 0.996$) significantly more threatening than the neutral images ($M = 1.072$, $SD = 0.141$), $t(37) = 11.455$, $p = .001$. See Table 4 for all t-tests conducted.

Hypothesis Testing

The proposed hypotheses were that (1) there will be greater skin conductance and heart rate responses to threat images over neutral images across all participants, (2) skin conductance and heart rate responses to threat images will increase as paranoia scores increase, and that (3)

skin conductance and heart rate responses will differ in those who have higher constricted affect scores than paranoia scores, in response to both threatening and neutral images.

Two paired sample t-tests were conducted comparing skin conductance and heart rate levels while participants were viewing either threatening or neutral images. These tests showed no significant differences in skin conductance or heart rate while participants were viewing either threatening or neutral images; skin conductance, $t(23) = .717$, $p = 0.481$, and heart rate, $t(29) = 0.239$, $p = 0.813$. See Table 4 for means and standard deviations. This data does not support the first hypothesis.

Correlational tests were also conducted to measure the relationship between paranoia scores and physiological responses to threatening images. There was a significant moderate negative relationship between paranoia and heart rate while viewing threatening images, $r(38) = -.439$, $p<.05$. There was a non-significant weak negative relationship between paranoia and skin conductance while viewing threatening images, $r(38) = -.219$, $p>.05$. This data does not support the second hypothesis. See Table 6 for correlations among the SPQ, paranoia scale, physiological data, and subjective data.

Correlations were conducted to measure the relationships among the SPQ and the two subscales, paranoia and constricted affect. As shown in Table 5, all three scales were significantly positively correlated with each other. Because the relationship between paranoia and constricted affect was a moderate positive relationship, $r(38) = .339$, $p<.05$, the third hypothesis was not supported by the data.

Exploratory Analyses

Four paired sample t-tests were conducted comparing baseline physiological levels to physiological responses to threatening and neutral images. These tests showed that heart rate was

significantly higher while participants were viewing threatening images ($M = 79.543$, $SD = 8.323$), $t(29) = 3.702$, $p = .001$, and when viewing neutral images ($M = 79.405$, $SD = 8.923$), $t(29) = 3.330$, $p = .002$, than baseline heart rate ($M = 75.960$, $SD = 9.399$). These tests also showed that skin conductance was significantly higher when participants were viewing threatening images ($M = 3.776$, $SD = 1.090$) over baseline skin conductance ($M = 2.976$, $SD = 1.154$), $t(24) = 6.429$, $p = .001$, and when viewing neutral images ($M = 3.846$, $SD = 1.108$) over baseline skin conductance ($M = 3.022$, $SD = 1.156$), $t(23) = 5.849$, $p = .001$.

Paranoia was simultaneously regressed on baseline heart rate, baseline skin conductance, mean heart rate to threatening images, mean skin conductance to threatening images, mean heart rate to neutral images and mean skin conductance to neutral images. Overall, the six predictors accounted for a significant amount of variability in paranoia scores, $R^2 = .659$, $F(6, 15) = 4.824$, $p = .006$. In the overall model there was a significant and positive beta for baseline mean heart rate, $b = .360$, $t = 3.060$, $p = .008$, and a significant and negative beta for mean heart rate to neutral images, $b = -.384$, $t = -2.612$, $p = .020$. The betas were not significant for baseline skin conductance, mean skin conductance to threatening images, mean skin conductance to neutral images, or mean heart rate to threatening images.

Discussion

Even though the data did not support the hypotheses, it is interesting to note that the physiological seemed to oppose the subjective data as reported by the participants. Participants subjectively rated the threatening images as more threatening than the neutral images, but physiological stress measures did not differ significantly between threatening and neutral images. This lack of physiological response differences does not reflect the increases in stress sensitivity in relation to paranoia that is reported in past literature (Ragsdale et al., 2013; Haralanova et al.,

2011). There are many reasons why this may have happened, including image presentation timing and anticipatory stress. Because the images were shown randomly, participants may have anticipated seeing a threatening image at any point during the study time. This may have led to an elevated heart rate and skin conductance throughout the duration of the image presentation portion of the experiment. There was a significant relationship between heart rate while viewing threatening images and paranoia scores, but it was a negative relationship, contradicting one of the proposed hypotheses. A possible reason for this is that the participants in this sample who scored high in paranoia may only feel the physical effects of stress when there is a perceived legitimate threat. In other words, the participants who scored higher on paranoia scales may have higher thresholds for stress responses to threat due to an increase in general threat vigilance throughout the day. Therefore, the expected increase in heart rate to threat stimuli may only happen to extraordinarily threatening stimuli rather than just moderately threatening stimuli. This would explain the negative relationship in this study because a lack of stress response increase to threat would mean the lower heart rate baseline levels seen in higher paranoia and schizotypy populations would continue into the experimental conditions.

The regression analysis did produce a significant model that showed the physiological data could be used to predict paranoia scores. One of the two significant betas though goes in the opposite direction from the corresponding correlation coefficient. Baseline mean heart rate had a significant moderate negative correlation with paranoia, but a significant positive beta in the regression model. It is unclear what is causing this change in direction. From this regression model though it can be reasoned that paranoia can be predicted by physiological stress measures. The regression analysis showed that as baseline heart rates increase, the predicted paranoia score increases. This finding fits in well with other paranoia and stress research stating that

physiological stress responses differ as paranoia increases, and that, specifically, higher baseline physiological levels can indicate a higher tendency to paranoia (Pinkham et al., 2015; Fleck, Green, Stevenson, Payne, Bowden, Jung-Beeman, Kounios, 2008).

The regression results found from this data have implications in clinical, as well as general psychological, research. Research in the future should focus on using physiological data as predictors for schizotypal symptom severity. Because paranoia is a symptom commonly found in many disorders and personality types, physiological predictors for paranoia are not limited to just schizotypy or the schizophrenia spectrum. Including physiological measures in clinical diagnoses and research can provide more support to traditional subjective measures of various symptoms. Many diagnostic tools, schizotypy scales, and stress scales used in research are subjective measures (Schoretsintis et al., 2016; Coan & Allen, 2007; Ellet, Lopes, & Chadwick, 2003) which has led to reliability and replication significance issues in research (Open Science Collaboration, 2015; Clark & Watson, 1995).

Limitations

Some limitations to this study include sample size and demographics, equipment difficulties, image selection and timing, and time between stimuli presentation. With a larger sample size there may have been a wider range in scale scores and physiological response changes. The data also has limited generalizability due to the sample demographics. All participants were young adults attending a mid-sized university, a large majority of the participants were white and most of the participants were female.

There were also many issues in using the equipment used to measure heart rate and skin conductance. The skin conductance data from 12 participants was either not collected or deemed unusable due to problems with the skin conductance recording equipment, and the heart rate data

from 8 participants was not collected or not analyzed for the same reason. While the images selected were significantly different in rated threat levels, 8 in each category may have been too few images to accurately measure response differences. Longer on-screen times for each image may have resulted in more accurate physiological response data. The time in between each image may also have been too short, thus not giving participants heart rate or skin conductance enough time to return to baseline levels. Future studies should consider adding images to each category and lengthening study run-time.

Conclusions

Despite the limitations to this study, there are some potential clinical applications for using physiological measures as predictors of paranoia or other symptoms regarding mental health and wellbeing. Much more research in this area is needed, but physiological measures of stress and possibly paranoia can lend extra reliability and validity support to traditional subjective measures and self-report questionnaires in these fields. Clark and Watson (1995) stress the importance of and give advice for increasing the reliability and validity for questionnaires used in research and diagnoses, but adding physiological measures to supplement these standard questionnaires would greatly benefit mental health research and treatment fields. Adding more diverse measures and predictors of psychological symptoms in research would aid in verifying significant or nonsignificant results, thus potentially reducing the reproducibility crisis (Open Science Collaboration, 2015). Physiological predictors for symptoms would also benefit the diagnostic mental health communities in providing extra support or validation to clinical interviews, diagnostic surveys, and other more subjective measures. Overall, this area of potential requires more replication studies and more specific research into the usability of physiological predictors of specific symptoms and symptom severity.

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Appendix A

Schizotypal Personality Questionnaire

Directions: Read each item and circle the response "Yes" or "No" that is true MOST of the time.

Please provide a response to all items.

1	Do you sometimes feel that things you see on the TV or read in the newspaper have a special meaning for you?
2	I sometimes avoid going to places where there will be many people because I will get anxious.
3	Have you had experiences with the supernatural?
4	Have you often mistaken objects or shadows for people, or noises for voices?
5	Other people see me as slightly eccentric (odd).
6	I have little interest in getting to know other people.
7	People sometimes find it hard to understand what I am saying.
8	People sometimes find me aloof and distant.
9	I am sure I am being talked about behind my back.
10	I am aware that people notice me when I go out for a meal or to see a film.
11	I get very nervous when I have to make polite conversation.
12	Do you believe in telepathy (mind-reading)?
13	Have you ever had the sense that some person or force is around you, even though you cannot see anyone?
14	People sometimes comment on my unusual mannerisms and habits.
15	I prefer to keep myself to myself.
16	I sometimes jump quickly from one topic to another when speaking.
17	I am not good at expressing my true feelings by the way I talk and look
18	Do you often feel that other people have it in for you?
19	Do some people drop hints about you or say things with a double meaning?
20	Do you ever get nervous when someone is walking behind you?
21	Are you sometimes sure that other people can tell what you are thinking?
22	When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes?
23	Sometimes other people think that I am a little strange.
24	I am mostly quiet when with other people.
25	I sometimes forget what I am trying to say.
26	I rarely laugh and smile.
27	Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?
28	Have you ever noticed a common event or object that seemed to be a special sign for you?
29	I get anxious when meeting people for the first time.
30	Do you believe in clairvoyance (psychic forces, fortune telling)?
31	I often hear a voice speaking my thoughts aloud.

32	Some people think that I am a very bizarre person.
33	I find it hard to be emotionally close to other people.
34	I often ramble on too much when speaking.
35	My "nonverbal" communication (smiling and nodding during a conversation) is not very good.
36	I feel I have to be on my guard even with friends.
37	Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you?
38	Do you often feel nervous when you are in a group of unfamiliar people?
39	Can other people feel your feelings when they are not there?
40	Have you ever seen things invisible to other people?
41	Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems?
42	Some people find me a bit vague and elusive during a conversation.
43	I am poor at returning social courtesies and gestures.
44	Do you often pick up hidden threats or put-downs from what people say or do?
45	When shopping, do you get the feeling that other people are taking notice of you?
46	I feel very uncomfortable in social situations involving unfamiliar people.
47	Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense?
48	Do everyday things seem unusually large or small?
49	Writing letters to friends is more trouble than it is worth.
50	I sometimes use words in unusual ways.
51	I tend to avoid eye contact when conversing with others.
52	Have you found that it is best not to let other people know too much about you?
53	When you see people talking to each other, do you often wonder if they are talking about you?
54	I would feel very anxious if I had to give a speech in front of a large group of people.
55	Have you ever felt that you are communicating with another person telepathically (by mind-reading)?
56	Does your sense of smell sometimes become unusually strong?
57	I tend to keep in the background on social occasions.
58	Do you tend to wander off the topic when having a conversation?
59	I often feel that others have it in for me.
60	Do you sometimes feel that other people are watching you?
61	I feel very uneasy talking to people I do not know well.
62	I attach little importance to having close friends
63	Do you sometimes feel that people are talking about you?
64	Are your thoughts sometimes so strong that you can almost hear them?
65	Do you often have to keep an eye out to stop people from taking advantage of you?
66	Do you feel that you cannot get "close" to people?
67	I am an odd, unusual person.
68	I do not have an expressive and lively way of speaking.
69	I find it hard to communicate clearly what I want to say to people.

70	I have some eccentric (odd) habits.
71	I feel very uneasy talking to people I do not know well.
72	People occasionally comment that my conversation is confusing.
73	I tend to keep my feelings to myself.
74	People sometimes stare at me because of my odd appearance.

Appendix B

Informed Consent Document

Informed Consent

Study Title: Schizotypy, Paranoia, and Threat: Stress Responses

Study Purpose and Rationale: The purpose of this study is to examine the relationships between schizotypy subscales and physiological stress responses to threatening images. Schizotypy is the term for the personality aspects often found in the schizophrenia spectrum, but these aspects are very mild and do not necessarily indicate any mental health abnormalities or diagnoses. These subscales include measures of paranoia, emotional expression, magical beliefs, eccentric behavior, and social anxiety. There are clear physiological responses to stress, such as heart rate and skin conductance increases. Certain situations, like feeling threatened, can cause these stress responses. This study is examining if people who score higher or lower on a schizotypy questionnaire have different physiological stress responses to threatening images. This questionnaire is not a measure of mental health.

Inclusion/Exclusion Criteria: You must be at least 18 years or older.

Participation Procedures and Duration: To participate in this study, you will need to provide consent for participating after reading this form. During this study, you will fill out a health survey, take a schizotypy survey, perform one behavioral task and view images while your skin conductance and heart rate levels are being recorded. The health survey is for collecting demographic information and any information that could affect skin conductance levels and heart rate. For recording skin conductance and heart rate levels, we will use three electrodes. They will be placed on three fingers of your left hand. This process is painless and should cause no discomfort. You will be asked to wash your hands before this process to remove any excess oils that may interfere with the connections. The entire experiment should take less than one hour. I will be in the room while you complete the tasks for any questions or if you experience any discomfort. None of the data collected during this time will be connected to your informed consent.

You will receive one Ball State research credit for participating in this study. If for any reason you feel unable to continue the study procedure, you will still receive course credit for participating. Alternative studies and procedures are available if you do not want to participate in this study for course credit.

Data Confidentiality: If you choose to participate in this study you will need to sign this consent document after you finish reading. However, all signed documents will be kept separate from your responses collected during this study. Hence your survey and task responses will be confidential and not be linked to your identity.

All of your data collected from participating in the study will be confidentially transferred into a computerized data set. In the data set, no identifying data/information will be recorded, in that your data will be coded with an arbitrary number and not associated with your identity.

Storage of Data and Data Retention Period: Data will be stored on a password protected computer and secure internal hard-drive, as well as a locked file cabinet for an indefinite amount of time. This confidential data will be kept indefinitely for scientific transparency and possible future use.

Risks or Discomforts: Some of the images you will be viewing during the experiment may cause mild discomfort. The electrodes used should not feel uncomfortable, but they may feel unnatural. If, at any time, you express discomfort for any reason, the examiner will discontinue the study.

Who to Contact Should You Experience Any Negative Effects from Participating in this Study: If you experience any negative effects from participating in this study, please contact the Ball State Counseling Center in Lucina Hall, 765-286-1736.

Benefits: There are no anticipated benefits.

Voluntary Participation: Your participation in this study is completely voluntary and you are free to withdraw your permission at any time for any reason without penalty or prejudice from the investigator. Please feel free to ask any questions for the investigator before or during the experiment.

IRB Contact Information: For questions about your rights as a research subject, please contact the Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070 or at irb@bsu.edu.

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Consent to Participate: Please fill out the lines below to consent to participate.

I, _____ (print name) have read and understand the above information and agree to participate in the research project entitled, Schizotypy, Paranoia, and Threat: Stress Responses.

Signature: _____ **Date:** / /

[Approved IRB Protocol #:

Appendix C

Health and Demographic Survey

Health Survey Participant Code:_____

The following set of questions is to screen for factors known to affect sensory information processing. Please be as honest as possible. Circle the correct responses for all the following.

1. What is your date of birth?

2. What is your sex?
   a. Male
   b. Female
   c. Transgender
   d. Other
   e. Prefer not to respond

3. What is your ethnicity?
   a. American Indian or Alaska Native
   b. Asian
   c. Black or African American
   d. Native Hawaiian or Other Pacific Islander
   e. White
   f. Hispanic/Latino/Latina
   g. Other
   h. Prefer not to respond

4. Have you ever hit your head and experienced a concussion? Yes No

   If yes, please explain and include the date and number of concussions experienced.

5. Have you ever experienced loss of consciousness? Yes No

   If yes, please explain and include the duration of loss of consciousness.

6. Since birth have you ever had any other medical problems? Yes No
   If yes, please explain.

7. Since birth have you ever been hospitalized? Yes No
   If yes, please explain.

8. Do you use tobacco (smoke and/or chew)? Yes No
   If yes, please explain.

9. Do you have a history of substance abuse? Yes No

10. Have you had any hearing problems? Yes No
    If yes, please explain.

11. Are you on any medications? Yes No
    If yes, please list them all including birth control.

12. Do you have any visual problems or impairment? Yes No
    If yes, please explain.

13. Do you have now or have you ever had any of the following? Circle yes or no.

Diabetes	Yes	No
Neurological disorder	Yes	No
Vascular disorder	Yes	No
Stroke	Yes	No
Learning deficiency or disorder	Yes	No
Reading deficiency or disorder	Yes	No

Attention-deficit disorder	Yes	No
Hyperactivity	Yes	No

If you checked yes for any of the items in question 13, please describe your diagnosis briefly.

Table 1. Normative ratings of IAPS pictures.

IAPS picture number/description	Valence Rating[a] *M*(S.D.)	Arousal Rating[b] *M*(S.D.)	Dominance Rating[c] *M*(S.D.)
Threatening			
1120; open mouth snake	3.79(1.93)	6.93(1.68)	3.87(2.31)
1525; attack dog	3.09 (1.72)	6.51 (2.25)	3.15(2.2)
1930; shark	3.79(1.92)	6.42(2.07)	3.19(2.15)
2120; angry male face	3.34 (1.91)	5.18 (2.52)	4.52(2.52)
2691; rioting man	3.04(1.73)	5.85(2.03)	4.07(2.02)
6250.1; man pointing gun at observer	2.63(1.74)	6.92(1.92)	2.40(1.88)
6830; masked man with guns	2.82(1.81)	6.21(2.23)	3.67(2.50)
9810; KKK rally	2.09(1.78)	6.62(2.26)	3.95(2.50)
Neutral			
2190; man	4.83(1.28)	2.41(1.80)	5.92(2.01)
2440; neutral girl	4.49(1.03)	2.63(1.70)	5.97(1.89)
2480; elderly man	4.77(1.64)	2.66(1.78)	5.33(2.09)
2840; chess	4.92(1.79)	2.31(1.88)	5.56(1.93)
5130; rocks	4.45(1.13)	2.51(1.72)	5.84(1.98)
7010; basket	4.94(1.07)	1.76(1.48)	6.70(1.48)
7004; spoon	5.04(0.60)	2.00(1.6)	6.74(1.99)
7175; lamp	4.87(1.00)	1.72(1.26)	6.47(2.04)

[a] Ranges from unpleasant (1) to pleasant (9)

[b] Ranges from calm (1) to excited (9)

[c] Ranges from controlled (1) to in-control (9)

Table 2. Mean ratings and t-tests of data set.

	Threatening *M*(S.D.)	Neutral *M*(S.D.)	t-value (*df*)
Valence Rating[a]	*3.07*(0.54)	*4.79*(0.20)	-7.89(*9*)*
Arousal Rating[b]	*6.33*(0.55)	*2.25*(0.35)	16.58(*12*)*
Dominance Rating[c]	*3.60*(0.62)	*6.07*(0.49)	-8.26(*13*)*

[a] Ranges from unpleasant (1) to pleasant (9)

[b] Ranges from calm (1) to excited (9)

[c] Ranges from controlled (1) to in-control (9)

*$p < .01$ (two-tailed).

Table 3. Scale reliabilities

Scale	Cronbach's Alpha	Mean	Standard Deviation	Items
SPQ Total	0.909	20.95	10.967	74
Paranoia	0.751	5.71	3.41	17
Constricted Affect	0.66	1.71	1.66	8

Table 4. Baseline, Threat, and Neutral T-Test Comparison Results

Pair	Mean	Standard Deviation	N	t	Sig.
Ratings Threat vs Neutral	2.822	0.996	38	11.455	0.001
	1.072	0.141	38		
HR Threat vs Neutral	79.543	8.323	30	0.239	0.813
	79.405	8.923	30		
SC Threat vs Neutral	3.810	1.100	24	-.717	0.481
	3.846	1.108	24		
HR Baseline vs Threat	75.960	9.399	30	-3.702	.001
	79.543	8.323	30		
HR Baseline vs Neutral	75.960	9.399	30	-3.330	.002
	79.405	8.923	30		
SC Baseline vs Threat	2.976	1.154	25	-6.429	.001
	3.776	1.090	25		
SC Baseline vs Neutral	3.022	1.156	24	-5.849	.001
	3.846	1.108	24		

Table 5. Scale and subscale correlations

	SPQ	Paranoia	Constricted Affect
SPQ	1		
Paranoia	.726**	1	
Constricted Affect	.760**	.339*	1

*p<.05 **p<.01

Table 6. Scale by physiological and behavioral data correlations

	Paranoia Scale	SPQ Total	Baseline HR	Baseline SC	Threat HR	Threat SC	Neutral HR	Neutral SC	Threat Ratings
Paranoia Scale	-								
SPQ Total	.726**	-							
Baseline HR	-.358*	-.274	-						
Baseline SC	-.219	-.335	0.08	-					
Threat HR	-.439*	-.254	.828**	0.111	-				
Threat SC	-.286	-.353	.172	.848**	-.045	-			
Neutral HR	-.502**	-.370*	.810**	0.103	.935**	.006	-		
Neutral SC	-.309	0.098	-.186	.667**	-.091	.975**	-.088	-	
Threat Ratings	0.27	0.242	-.073	-.077	-.011	-.027	-.115	0.003	-
Neutral Ratings	.410*	0.061	-.151	0.012	-.263	.187	-.171	-.035	.445**

*p<.05 **p<.01

Office of Research Integrity
Institutional Review Board (IRB)
2000 University Avenue
Muncie, IN 47306-0155
Phone: 765-285-5070

DATE: February 12, 2018

TO: Kierstin Riels

FROM: Ball State University IRB

RE: IRB protocol # 1162988-1
TITLE: Schizotypy, Paranoia, and Threat: Stress Responses
SUBMISSION TYPE: New Project

ACTION: APPROVED
DECISION DATE: January 24, 2018
EXPIRATION DATE: January 22, 2020
REVIEW TYPE: **Expedited:** This protocol had been determined by the board to meet the definition of minimal risk.

The Institutional Review Board has approved your New Project for the above protocol, effective January 24, 2018 through January 22, 2020. All research under this protocol must be conducted in accordance with the approved submission and in accordance with the principles of the Belmont Report.

Review Type:

	Category 1: Clinical studies of drugs and medical devices
	Category 2: Collection of blood samples by Finger stick, Heel stick, Ear stick, or Venipuncture
	Category 3: Prospective collection of biological specimens for research purposes by noninvasive means
x	**Category 4:** Collection of data through Non-Invasive Procedures Routinely Employed in Clinical Practice, excluding procedures involving Material (Data, Documents, Records, or Specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis)
	Category 5: Research involving materials that have been collected or will be collected solely for non-research purposes.
	Category 6: Collection of Data from Voice, Video, Digital, or Image Recordings Made for Research Purposes

x	**Category 7:** Research on Individual or Group Characteristics or Behavior or Research Employing Survey, Interview Oral History, Focus Group, Program Evaluation, Human Factors, Evaluation, or Quality Assurance Methodologies
	Category 8: Continuing review of research previously approved by the convened IRB
	Category 9: Continuing review of research, not conducted under an investigational new drug application or investigational device exemption where categories 2-8 do not apply but the IRB has determined and documented at a convened meeting that the research involves no greater than minimal risk and not additional risks have been identified.

Editorial Notes:

1. Approved

As a reminder, it is the responsibility of the P.I. and/or faculty sponsor to inform the IRB in a timely manner:

- when the project is completed,
- if the project is to be continued beyond the approved end date,
- if the project is to be modified,
- if the project encounters problems, or
- if the project is discontinued.

Any of the above notifications must be addressed in writing and submitted electronically to the IRB (http://www.bsu.edu/irb). Please reference the IRB protocol number given above in any communication to the IRB regarding this project. Be sure to allow sufficient time for review and approval of requests for modification or continuation. If you have questions, please contact Grace Pardieck at (765) 343-6672 or gapardieck@bsu.edu.

In the case of an adverse event and/or unanticipated problem, you will need to submit written documentation of the event to IRBNet under this protocol number and you will need to directly notify the Office of Research Integrity (http://www.bsu.edu/irb) **within 5 business days**. If you have questions, please contact (ORI Staff).

Please note that all research records must be retained for a minimum of three years after the completion of the project or as required under Federal and/or State regulations (ex. HIPAA, FERPA, etc.). Additional requirements may apply.

D. Clark Dickin, PhD/Chair
Institutional Review Board

Christopher Mangelli, JD, MS, MEd, CIP/
Director
Office of Research Integrity